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Nakamura

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[54] **LEVER HOIST**

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[73] Assignee: **Kabushiki Kaisha Kito,** Kawasaki, Japan

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[30] **Foreign Application Priority Data**

Mar. 1, 1982 [JP] Japan ..... 57-27162[U]

[51] **Int. Cl.**[3] **B66F 19/00;** B66F 3/30; G05G 1/12; F16D 13/42

[52] **U.S. Cl.** ..... **254/350;** 254/352; 254/353; 254/357; 74/577 M; 192/43.1; 192/93 A

[58] **Field of Search** ..... 254/357, 346, 347, 217, 254/218, 352, 353, 354, 369, 350; 74/577 M, 577 SF, 577 S, 577 R; 192/20, 21, 43.1, 93 A, 95

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Attorney, Agent, or Firm—Sughrue, Mion, Zinn, Macpeak and Seas

[57] **ABSTRACT**

A lever hoist comprises a change gear for driving a sheave for winding-up a chain or rope for a load, an operating lever rockably driven by a hand, winding-up and winding-off driving pawls engageable with teeth of the change gear and changeable in response to the purpose of hoisting or lowering the load, and a braking assembly for preventing the change gear from being driven by a gravity of the load and having a spring for releasing the braking assembly. According to the invention, the winding-up and winding-off driving pawls are formed in a unitary member pivotally secured to the operating lever and opposite portions of the pawls of the unitary member are engageable with a holding member urged by a spring, and a distance between a center of the pivot shaft and the portion associated with the winding-off driving pawl is larger than a distance between the center of the pivot shaft and the portion associated with the winding-up driving pawl, so that the winding-off pawl is urged against the teeth with a larger force than that of the winding-up pawl urged against the teeth. With such an arrangement, when a light load is hoisting up, the return movement of the operating lever does not carry along the change gear. When a light load which does not operate the braking assembly is lowering, the large urging force of the winding-off driving pawl prevents the change gear from rotating against the winding-off driving pawl.

1 Claim, 8 Drawing Figures

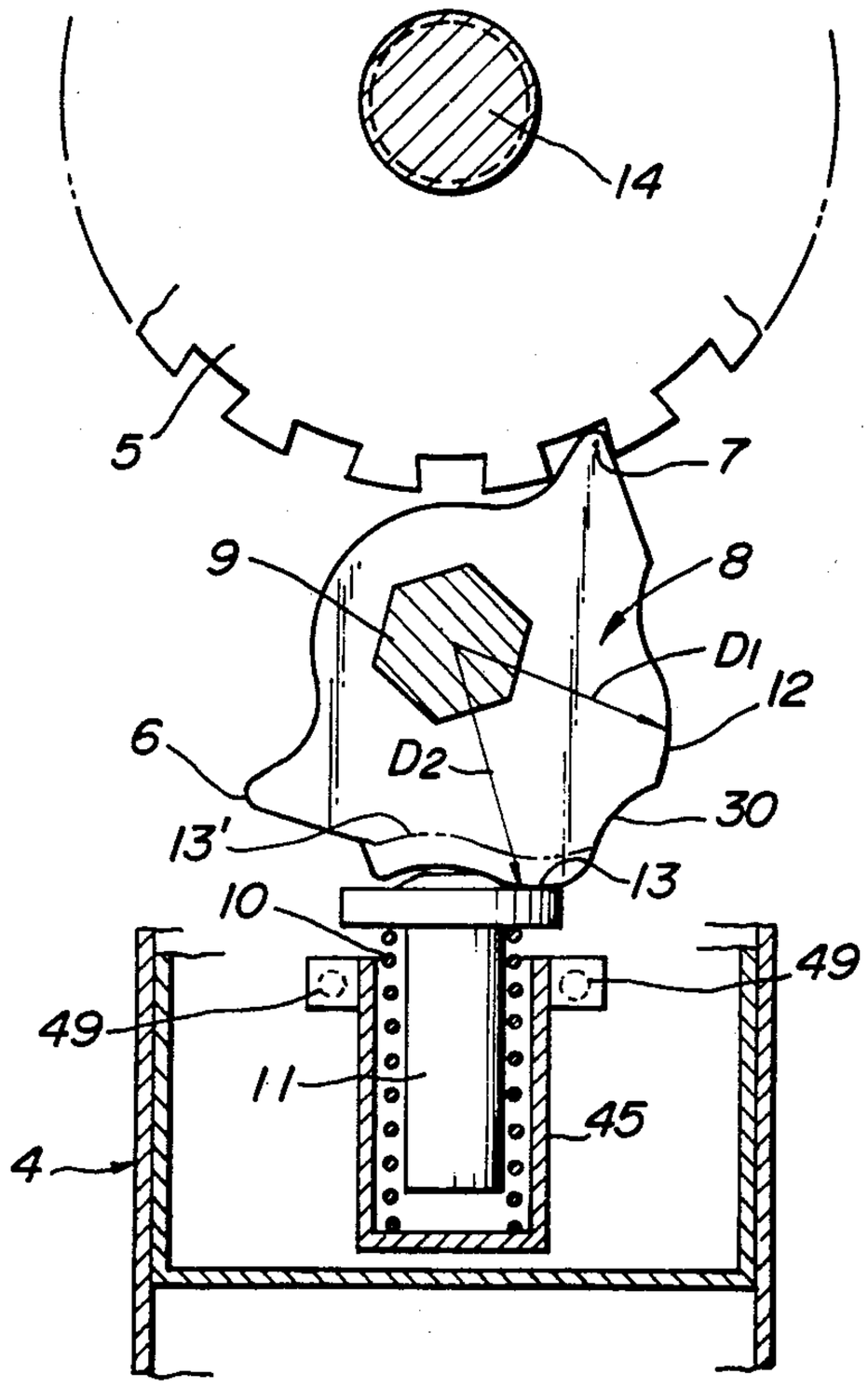
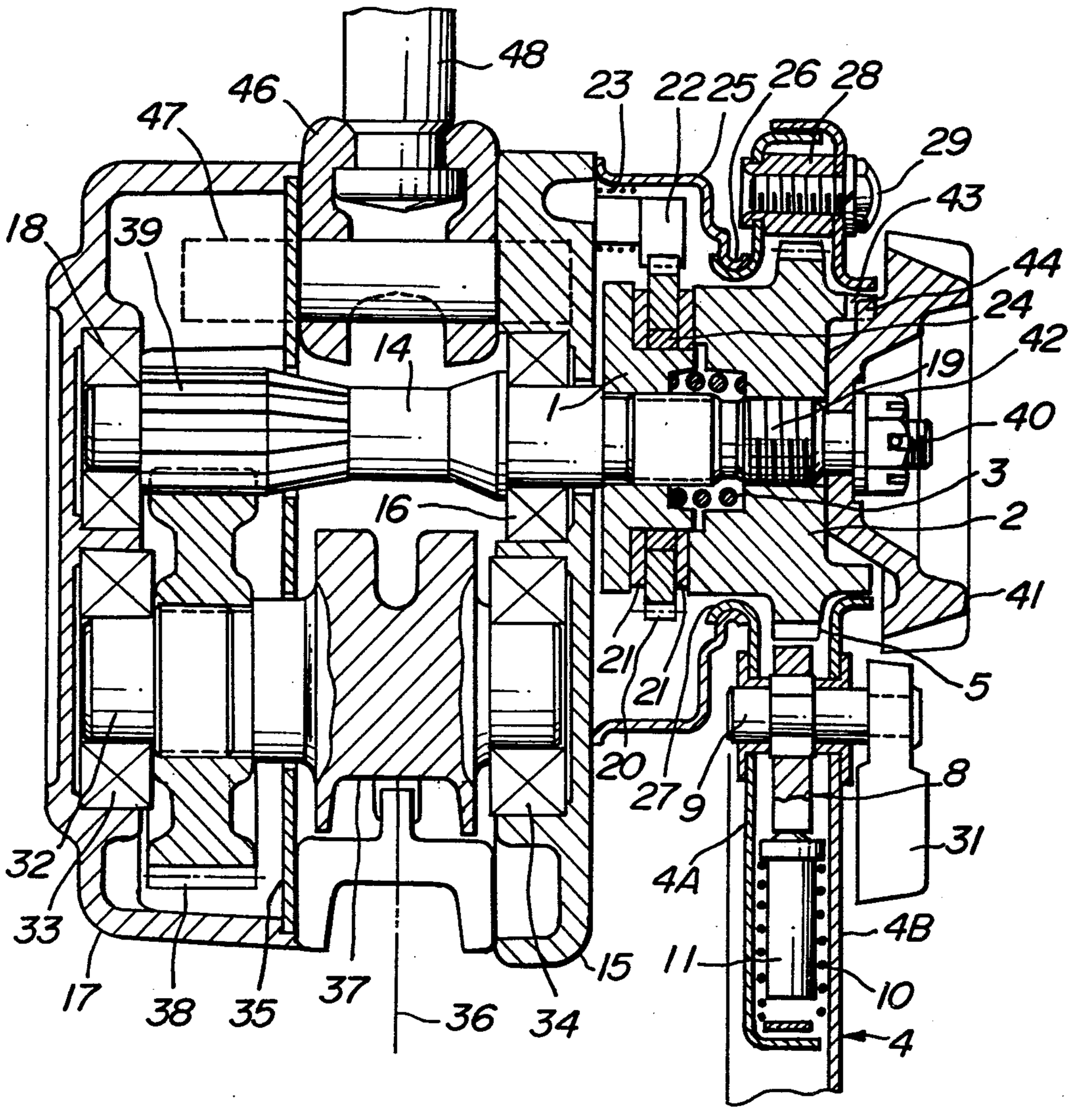


FIG. 1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4A
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FIG.2

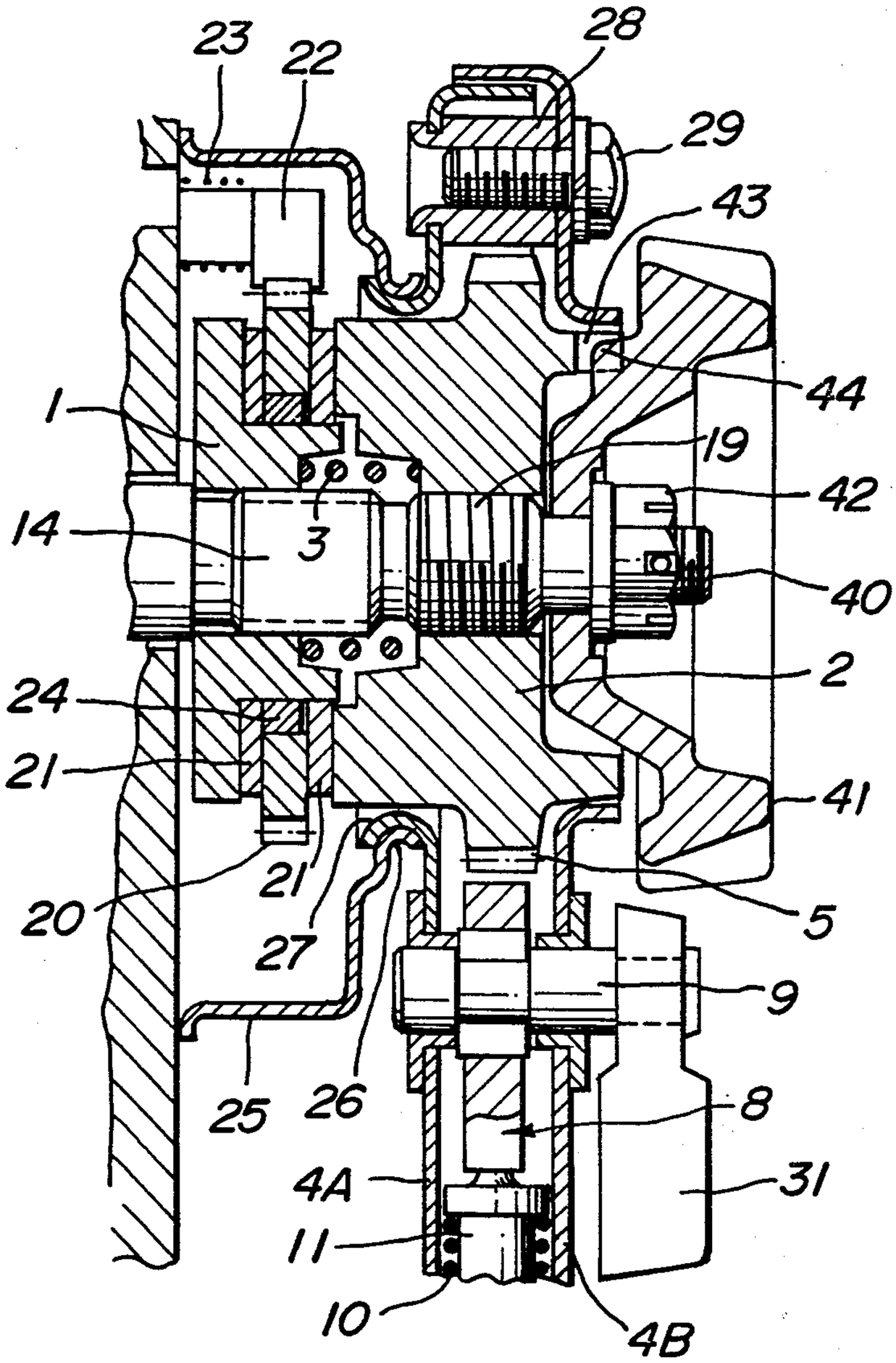
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FIG. 3

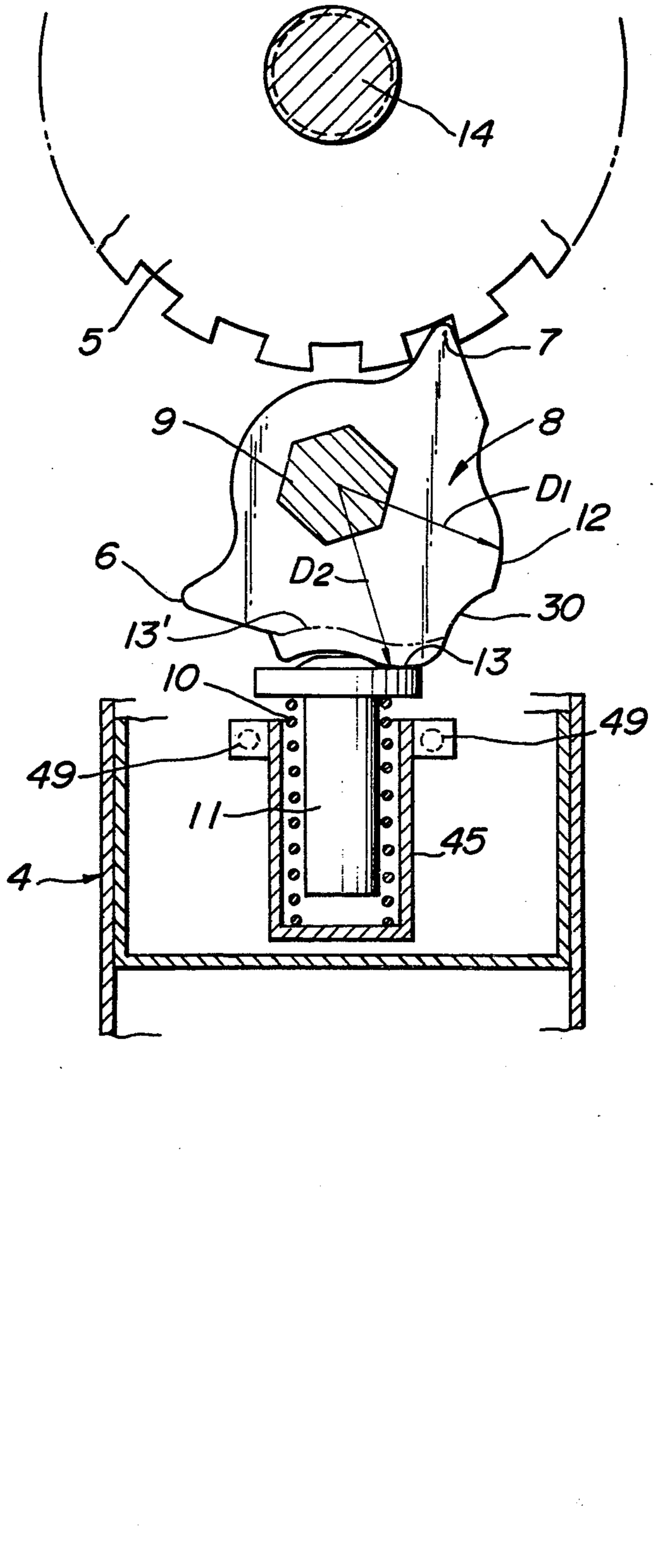


FIG. 4

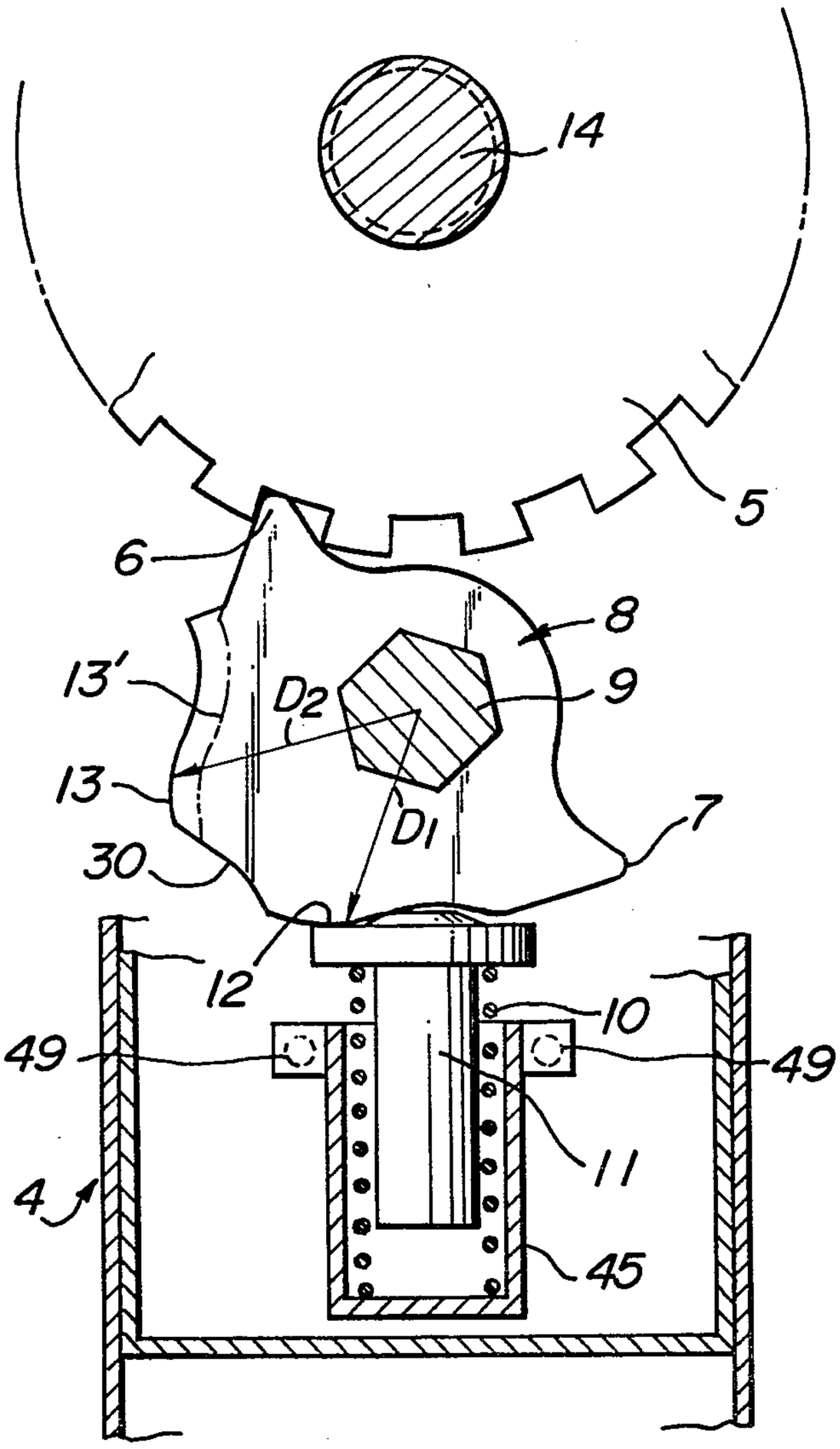


FIG. 5

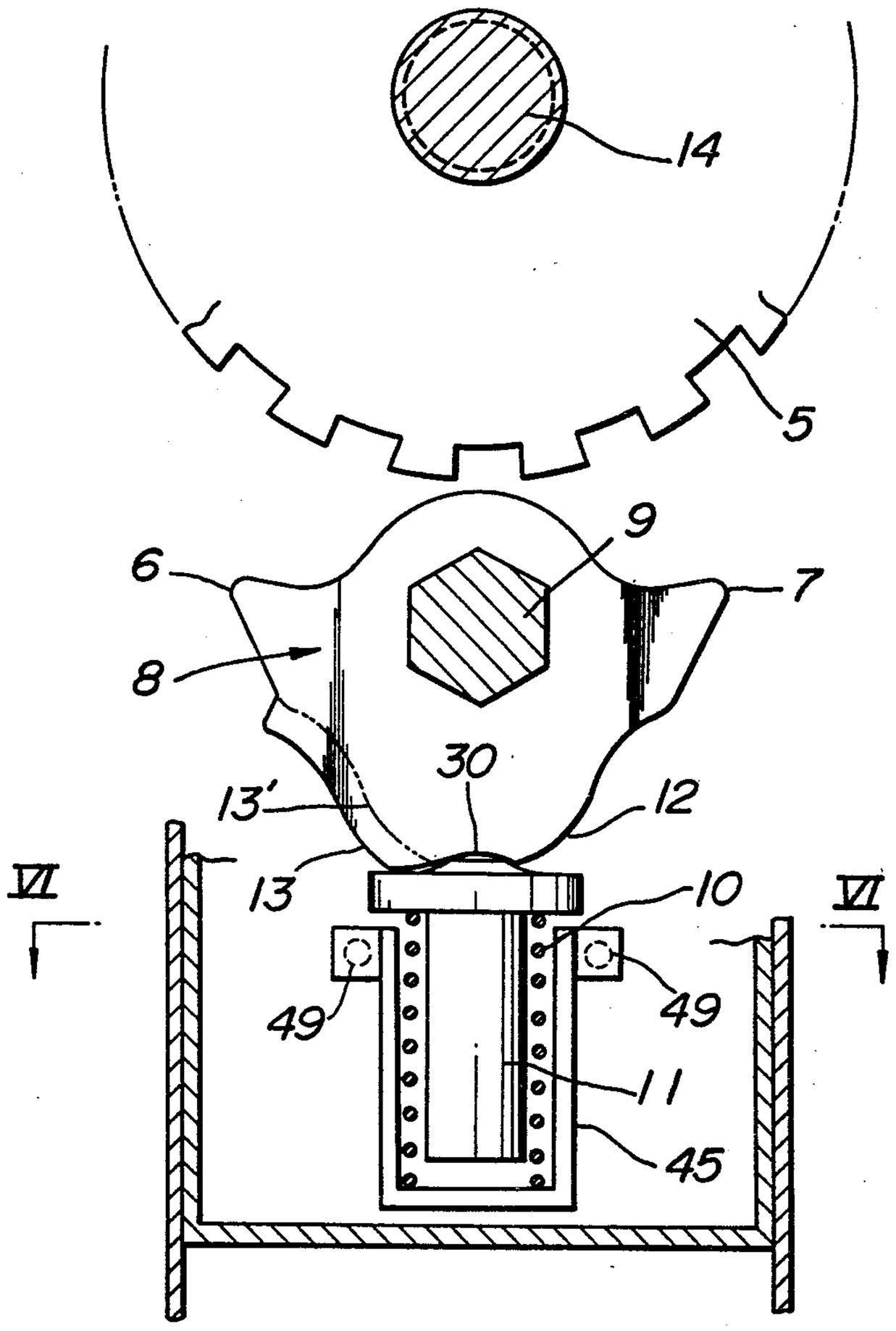


FIG. 6

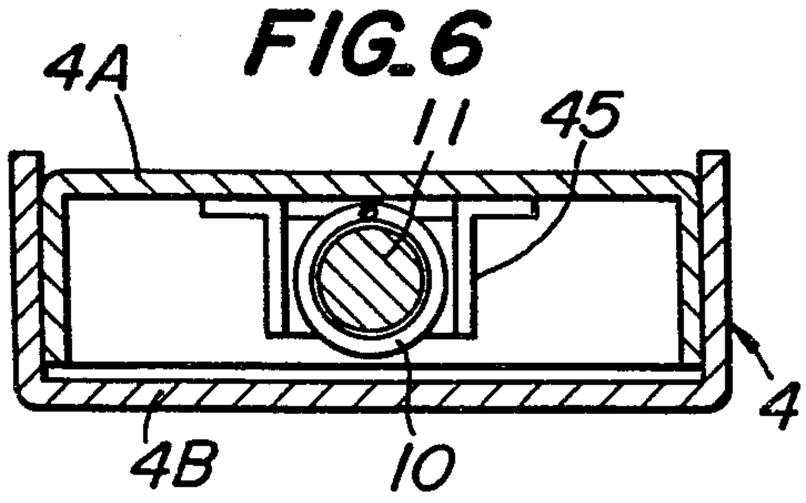


FIG. 7

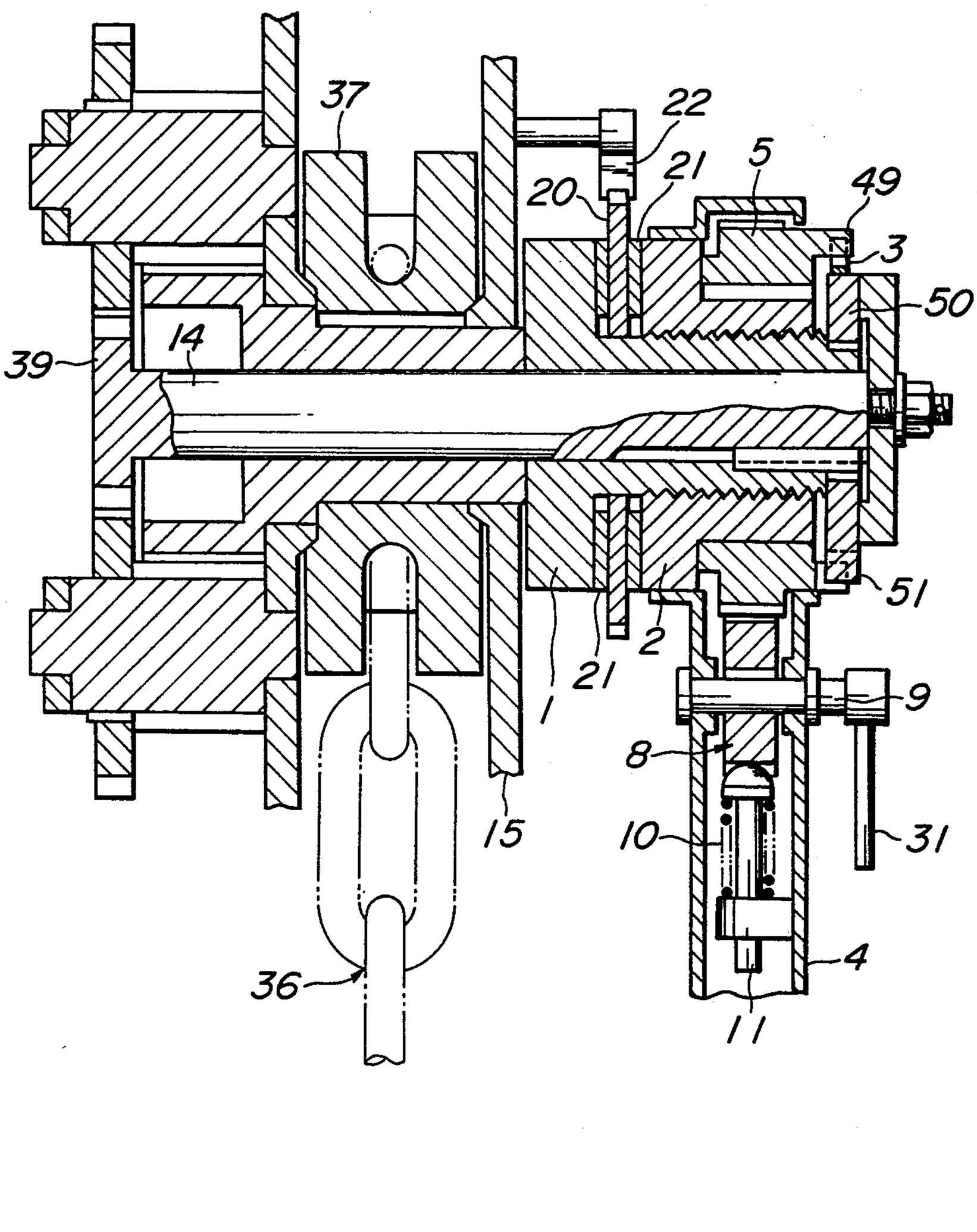
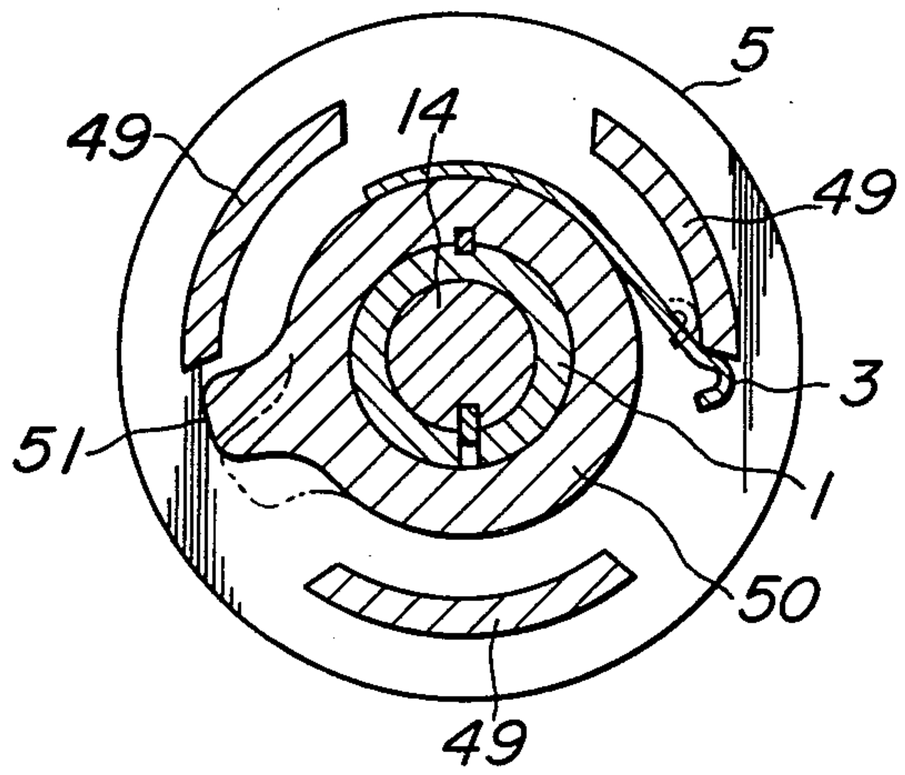


FIG_8



LEVER HOIST

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a lever hoist for use in raising, lowering or dragging objects to be transferred by repeatedly rocking a lever of the hoist.

2. Description of the Prior Art

Lever-operated small type hoisting and dragging devices have been known. One of these devices includes an elastic resistance member interposed between a driving member and a driven member for releasing a braking assembly, and an operating lever rockable about the driving member. The operating lever includes a change pawl metal pivotally secured thereto having winding-up and winding-off driving pawls detachably engageable with a change gear on the driving member for respectively driving the change gear in winding-up and winding-off directions and engagement portions for respectively holding the winding-up and winding-off directions. The operating lever is further provided with a holding member adapted to be detachably engaged with the engagement portions of the change pawl metal by means of an engagement spring. With such a device, urging forces of the pawls engaged with the change gear are substantially equal to each other.

With the known device, if the urging force of the winding-up driving pawl acting upon the change gear by the action of the engagement spring is too large, the change gear and hence the driving member are returned by a return movement of the operating lever for a next driving movement when a light load is hoisting by the device. Accordingly, such a device cannot hoist a light load. On the other hand, when a light load is lowering by the device, the urging force of the winding-off driving pawl acting upon the change gear by the engagement spring is too small, the change gear overcomes the weak urging force so as to be rotated by a gravity force of the load, because such a light load does not operate the braking assembly. Frequently, the known device cannot therefore lower a light load.

SUMMARY OF THE INVENTION

It is an object of the invention to provide an improved lever hoist which eliminates the above disadvantages of the prior art by providing a larger urging force of a winding-up driving pawl and a smaller urging force of a winding-off driving pawl against a change gear.

A lever hoist including a change gear provided on a driving member for driving a sheave about which is wound up a chain, rope or the like for a load, an operating lever rockable about said driving member by a hand, a winding-up driving pawl engageable with teeth of said change gear and driven by said operating lever in a winding-up direction for the load, a winding-off driving pawl engageable with the teeth of said change gear and driven by said operating lever in a winding-off direction for the load, and a braking assembly preventing said change gear from being driven from a side of said sheave and having an elastic resistance member directly or indirectly engaging said driving member for releasing said braking assembly, according to the invention said lever hoist comprises urging means for urging said winding-up and winding-off driving pawls against said teeth of said change gear in a manner such that said winding-off driving pawl is urged against said teeth with a larger force than that of said winding-up driving pawl urged against said teeth.

In a preferred embodiment of the invention, the urging means comprises an urging spring housed in the operating lever and a holding member urged by the urging spring to move the winding-up and winding-off driving pawls against the teeth of the change gear. The winding-up and winding-off driving pawls are formed in a unitary member pivotally secured to the operating lever by means of a pivot shaft, and opposite portions to the pawls of the unitary member are made engageable with the holding member and serve as winding-up and winding-off direction holding portions for holding the winding-up and winding-off driving pawls relative to the operating lever, respectively. A distance between a center of the pivot shaft and the winding-off direction holding portion is larger than a distance between the center of the pivot shaft and the winding-up direction holding portion of the unitary member.

The invention will be more fully understood by referring to the following detailed specification and claims taken in connection with the appended drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a sectional view of a lever hoist of one embodiment of the invention;

FIG. **2** is an enlarged partial sectional view illustrating a driving portion with an operating lever and a braking assembly of the lever hoist shown in FIG. **1**;

FIG. **3** is a front elevation, partially in section, showing a winding-off driving pawl in engagement with a change gear of the lever hoist shown in FIG. **1**;

FIG. **4** is a front elevation, partially in section, showing a winding-up driving pawl in engagement with the change gear of the lever hoist shown in FIG. **1**;

FIG. **5** is a front elevation, partially in section, showing the pawls in a neutral position of the lever hoist shown in FIG. **1**;

FIG. **6** is a sectional view taken along a line VI—VI in FIG. **5**;

FIG. **7** is a sectional view of another type lever hoist to be applied with the invention; and

FIG. **8** is a cross-sectional view of the proximity of an elastic resistance member mounting portion of the lever hoist shown in FIG. **7**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS **1–6** illustrating one embodiment of the invention, a driving shaft **14** is journaled at its mid portion by a bearing **16** in a frame **15** and has one end journaled by a bearing **18** in a gear box **17** and the other end formed with external screw threads **19** for a braking assembly adapted to be threadedly engaged with internal screw threads of a driving member **2** having change gear teeth **5**. A driven member **1** is fitted against rotation on the driving shaft **14** between the frame **15** and driving member **2** and abuts against an enlarged diameter portion of the driving shaft **14** journaled by the bearing **16**.

Between the driving member **2** and the driven member **1** are interposed a brake ratchet wheel **20** and friction plates **21** abutting against opposite sides thereof. A brake pawl **22** pivotally secured to the frame **15** is brought into engagement with the brake ratchet wheel **20** by an engagement spring **23**. The brake ratchet wheel **20** has a center hole within which is fitted an

oilless bearing **24** of a sintered alloy. The ratchet wheel **20**, friction plates **21** and bearing **24** are fitted on a reduced diameter portion of the driven member **1** to form a braking assembly. Moreover, between the driving and driven members **2** and **1** is interposed a released brake position holding elastic resistance member **3** made of a coil spring which serves to prevent the driving member **2** from moving in its braking direction. In hoisting and lowering a heavy load, the driving shaft **14** tends to be rotated by a gravity of the load, so that when the driving shaft **14** is rotated, the driving member **2** is moved against the coil spring **3** to the left as viewed in FIG. **1** because of the threaded engagement of the driving shaft **14** and driving member **2**. Accordingly, the driving member **2** urges the ratchet wheel **20** and friction plates **21** against the driven member so that the driving shaft **14** is prevented from rotating with the aid of the brake pawl **22** connected to the frame **15**.

The driven member **1**, brake ratchet wheel **20**, friction plates **21**, brake pawl **22** and part of the driving member **2** are covered by a metal brake cover **25** formed on one side by pressing with a fixed support ring **26** having a U-shaped cross-section in opposition to an intermediate outer circumferential surface of the driving member **2**. An inner lever component member **4A** made of metal plates is formed on its bottom portion associated with the brake cover **25** by pressing with a rotatable support ring **27** which is adapted to be fitted in the fixed support ring **26** rotatable but against axial movement relative thereto in a manner enclosing the support ring **26**.

Cylindrical spacers **28** having internal screw threads are fitted and fixed by calking in apertures of the bottom portion of inner level component members **4A** and **4B** which are joined by connecting bolts **29** threadedly engaged within the spacers **28** to form an operating lever **4** rockable about a center line of a change gear **5**.

The brake cover **25** is fixed on the side opposite to the fixed support ring **26** to the frame **15** by means of bolts (not shown). A handle or knob **31** is fixed to a pivot shaft **9** rotatably supported in the operating lever **4**. To the pivot shaft **9** is fixed a change pawl metal **8** including a winding-up direction driving pawl **6** and a winding-off direction driving pawl **7** which are detachably engageable with the change gear **5** and a winding-up direction holding engagement portion **12**, a winding-off direction holding engagement portion **13** and a neutral position holding engagement portion **30** (FIGS. **3**, **4** and **5**).

A channel-shaped journal metal **45** is arranged in the inner lever component member **4A** and is fixed thereat by spot welding as shown at **49**. A holding member **11** is arranged movable toward and away from the change pawl metal **8** to detachably engage the winding-up direction holding engagement portion **12**, winding-off direction holding engagement portion **13** and neutral position holding engagement portion **30** by means of an engagement or urging spring **10** located in the journal metal **45**. A distance D_2 between a center of the pivot shaft **9** and the winding-off direction holding engagement portion **13** of the change pawl metal **8** is larger than that D_1 between the center of the pivot shaft **9** and the winding-up direction holding engagement portion **12**.

As can be seen from phantom lines **13'** in FIGS. **3–5** which are symmetrical lines of the contour of the winding-up direction holding engagement portion **12**, the winding-off direction holding engagement portion **13** outwardly extends beyond the lines **13'**. As shown in FIG. **3**, therefore, when the holding member **11** engages the winding-off direction holding engagement portion **13**, the engagement spring **10** is compressed more than in case of the winding-up direction holding engagement portion **12** in engagement with the holding member **11**. Hence the winding-off direction driving pawl **7** is urged against the change gear **5** with a larger compressive force than in the driving pawl **6**. The reason why the distance D_2 determines the urging force of the driving pawl **7** is the fact that when the driving pawl **7** engages the change gear **5**, the engagement portion **13** on an opposite side of the pawl **7** with respect to the pivot shaft **9** abuts against the holding member **11**.

On the other hand, when the holding member **11** engages the engagement portion **12** as shown in FIG. **4**, the engagement spring **10** is less compressed and the driving pawl **6** is urged against the change gear **5** with a smaller compressive force than in the driving pawl **7**. The reason why the distance D_1 determines the urging force of the driving pawl **6** is the fact that when the pawl **6** engages the gear **5**, the engagement portion **12** is on an opposite side of the pawl **6** with respect to the pivot shaft **9** and abuts against the holding member **11**.

FIG. **5** illustrates the change pawl metal **8** in a neutral position wherein the holding member **11** engages the neutral position holding engagement portion **30**.

Turning back to FIG. **1**, a driven shaft **32** is arranged in parallel with and under the driving shaft **14**. One end of the shaft **32** is journaled in a bearing **33** in the gear box **17** of which opening is closed by a cover plate **35** fitted therein and the other end is journaled in a bearing **34** in the frame **15**. The driven shaft **32** is formed integrally with a load sheave **37** between the frame **15** and cover plate **35** for winding a chain **36** (symbolically shown in a chain line in FIG. **1**) thereabout. In the gear box **17**, the driven shaft **32** is provided with a large gear **38** fixed thereto adapted to engage a pinion **39** formed in the end of the driving shaft **14**.

The driving shaft **14** is further provided on the other reduced diameter end **40** with a quick-manually operated knob **41** fitted thereon and fixed thereto by a knob fixing nut **42** which is threadedly engaged with the reduced diameter end **40** by means of locking means such as a split pin or the like. The driving member **2** is formed in its outer end portion with an engagement groove **43** for receiving an engagement protrusion **44** provided in an inner end portion of the knob **41**.

Under a no-load condition, the braking assembly is released by an action of the elastic resistance member **3**. The change pawl metal **8** is then changed into its neutral position (FIG. **5**) to move both the driving pawls **6** and **7** away from the change gear **5**. Thereafter the knob **41** is gripped and rotated to rotate the driving shaft **14** and driving member **2** and hence the load sheave **37**, thereby rapidly effecting positional adjustment of the load chain **36**.

In FIG. **1**, an upper hook **48** is anchored to a hook support metal **46** mounted on a support rod **47** extending between the frame **15** and gear box **17**.

In carrying out the invention, the manually-operated knob **41** may be integrally formed with the driving member **2**, and the elastic resistance member **3** for holding the released braking assembly may be positioned between the driving member or the knob and a shoulder formed in the driving shaft.

It is understood that the invention can be applied to another small type lever-operated hoisting and drag-

ging device as shown in FIGS. 7 and 8, wherein like components have been designated by the same reference numerals. With such device, to a driving shaft **14** is fixed a driven member **1** on which is threadedly engaged a driving member **2**. A change gear **5** is fitted on an outer surface of the driving member **2** against rotation relative thereto. The gear **5** is integrally provided at its one end with a plurality of engagement members **49** circumferentially spaced with each other. A holding member **50** is integrally formed with anchoring protrusions **51** adapted to be positioned between the adjacent engagement member **49** when the holding member **50** is fitted on one end of the driven member **1** against rotation relative thereto. A released brake position holding elastic resistance member **3** made of a leaf spring has a fixed end and is adapted to engagement members **49**. A construction and operation of such a lever operated hoisting and dragging device shown in FIGS. **7** and **8** are explained in detail in Japanese Laid-open patent application specification No. 55-2,570.

The holding member **11**, engaging the change pawl metal **8**, may be made of a leaf spring. Moreover, the pawl metal **8** may be formed integrally with a pivot shaft **9**.

According to the invention, the distance D_2 between the center of the pivot shaft **9** and the winding-off direction holding engagement portion **13** of the change pawl metal **8** is larger than the distance D_1 between the center of the pivot shaft **9** and the winding-up direction holding engagement portion **12**. Therefore, the urging forces of the winding-up driving pawl **6** and winding-off driving pawl **7** against the change gear **5** by the action of the engagement spring **10** can be very easily changed such that the force becomes small in winding-up operation and large in winding off operation. As the urging force of the winding-up driving pawl **6** is small, when a light load is hoisted up, the return movement of the operating lever **4** does not carry along or return the change gear **5** and hence the driving member **2**. As the urging force of the winding-off driving pawl **7** is large, when the light load which does not operate the braking assembly is lowering, the large urging force of the winding-off driving pawl **7** prevents the change gear **5** from rotating against the driving pawl **7**. In this manner, the lever hoist according to the invention can raise and lower light weight loads by operation of the lever without any trouble.

While the invention has been particularly shown and described with reference to preferred embodiments thereof, it will be understood by those skilled in the art that the foregoing and other changes in form and details can be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. A lever hoist including a change gear provided on a driving member for driving a sheave about which is wound up a chain, rope or the like for a load, an operating lever rockable about said driving member by a hand, a winding-up driving pawl engageable with teeth of said change gear and driven by said operating lever in a winding-up direction for the load, a winding-off driving pawl engageable with the teeth of said change gear and driven by said operating lever in a winding-off direction for the load, and a braking assembly preventing said change gear from being driven from a side of said sheave and having an elastic resistance member directly or indirectly engaging said driving member for releasing said braking assembly, said lever hoist comprising urging means for urging said winding-up and winding-off driving pawls against said teeth of said change gear in a manner such that said winding-off driving pawl is urged against said teeth with a larger force than that of said winding-up driving pawl urged against said teeth, said urging means comprising an urging spring housed in said operating lever and a holding member urged by said urging spring so as to urge said winding-up and winding-off driving pawls against said teeth of said change gear, said winding-up and winding-off driving pawls being formed in a unitary member pivotally secured to said operating lever by means of a pivot shaft, opposite portions to said pawls of said unitary member being made engageable with said holding member and serving as winding-up and winding-off direction holding portions for holding said winding-up and winding-off pawls relative to said operating lever, respectively, and a distance between a center of said pivot shaft and said winding-off direction holding portion being larger than a distance between the center of said pivot shaft and said winding-up direction holding portion of said unitary member.

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